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REMARKS

Claims 1-5 and 12-14 are pending in this application. Claims 11 and 15 are cancelled. Claims 1-5 and 12-14 are amended to replace the term "composition" with the term "PSSA-PVDF membrane". The amendment finds basis in the application as originally filed. No new matter is added.

THE REJECTION OF CLAIMS 1-5 AND 11-15 UNDER 35 U.S.C. §112

Claims 1-5 and 11-15 are rejected under 35 U.S.C. §112, second paragraph as being indefinite. The Office Action alleges that the recitation of the term "composition" renders the scope of the claim unclear.

Applicant respectfully submits that claims 1-5 and 12-14 are amended to replace the term "composition" with the term "PSSA-PVDF membrane." Reconsideration and withdrawal of the rejection is requested in view of the amendment.

Claims 11 and 15 are cancelled, thereby rendering the rejection moot.

THE REJECTION OF CLAIMS 1-5 AND 11 UNDER 35 U.S.C. §102(e)

Claims 1-5 and 11 are rejected as being anticipated by Narayanan *et al.* (U.S. Patent No. 5,945,231). The Office Action alleges that the reference discloses a catalyst ink containing PVDF and a PSSA-PVDF membrane. The Office Action urges that Narayanan *et al.* discloses, in column 8, lines 42-46, an ink made out of crosslinked polystyrene sulfonic acid. It is further alleged that the catalyst includes a first layer of PVDF with a second layer of zeolite/crosslinked PSSA-PVDF. The Examiner cites column 8, lines 49-55, in support of the allegation. Applicant respectfully submits that as discussed below, claims 1-5 are not anticipated by the disclosure of Narayanan *et al.* Claim 11 is cancelled, thereby rendering the rejection moot.

Claims 1-5

Amended claim 1 recites:

A PSSA-PVDF membrane comprising a catalyst ink, wherein the catalyst ink comprises a catalytic material and poly(vinylidene fluoride).

Claims 2-5 depend from claim 1 and further define the membrane of claim 1.

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The disclosure of Narayanan *et al.*

The cited reference by Narayanan *et al.* discloses a catalyst decal containing PVDF that can be used to coat a substrate, such as a Teflon substrate or carbon fiber sheet. The reference further discloses that an alternative ink can be made with polystyrene sulfonic acid and PVDF. The reference discloses in column 8, lines 42-55:

The role of TEFLON in the catalyst layer could be significant in reducing the open area for methanol transport. In order to attain these properties, an alternative ink is to be made out of the crosslinked polystyrene sulfonic acid and PVDF or Kynar or a methanol rejecting zeolite such as mordenite. These layers can be applied in one or more layers with or without the catalysts. These additives can be applied in one or more layers. The inventors contemplate that the primary catalyst may be used with mere polyvinylidene fluoride (e.g., PVDF) for the first layer, whereas a combination with the zeolite/crosslinked sulfonic acid PVDF can be used for the second layer. PVDF can be obtained in very fine powders and can be dissolved in some organic solvents and dispersed easily with the catalyst ink.

The reference does not disclose a PSSA-PVDF membrane containing a catalyst ink wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride).

Differences between claims 1-5 and the disclosure of Narayanan *et al.*

Narayanan *et al.* does not disclose a PSSA-PVDF membrane containing a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride) as claimed in claim 1. The reference discloses, a catalyst decal containing PVDF that can be used to coat a substrate, such as a Teflon substrate or carbon fiber sheet. The reference does not disclose that the catalyst decal can be used with a PSSA-PVDF membrane. Nowhere in the reference does it disclose a PSSA-PVDF membrane. Thus, Narayanan *et al.* does not disclose every element of the claimed PSSA-PVDF membrane. Therefore, the reference does not anticipate the PSSA-PVDF membrane containing a catalyst ink, wherein the ink contains a catalytic material and poly(vinylidene fluoride) as claimed in amended claim 1.

Because claims 2-5 depend from claim 1, Narayanan *et al.* does not anticipate any of claims 2-5.

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THE REJECTION OF CLAIMS 1-5 AND 11-15 UNDER 35 U.S.C. §102(e)

Claims 1-5 and 11-15 are rejected as being anticipated by Prakash *et al.* (U.S. Patent No. 6,444,343). The Office Action alleges that the reference discloses a composition containing a catalyst ink that is applied to the surface of a PSSA-PVDF membrane. The Office Action alleges that the ink disclosed in Prakash *et al.* contains NAFION® which is allegedly a copolymer of tetrafluoroethylene and perfluorovinylethersulfonic acid. Applicant respectfully submits that as discussed below, claims 1-5 and 12-14 are not anticipated by the disclosure of Prakash *et al.*

Claims 11 and 15 are cancelled, thereby rendering the rejection moot.

Claims 1-5 and 12-14

Claims 1-5 are as defined above. Claims 12-14 depend from claim 1 and further define the membrane of claim 1.

The disclosure of Prakash *et al.*

Prakash *et al.* discloses fabrication of membrane electrode assemblies prepared by heat-pressing the polymer electrolyte membrane sample, in its hydrated state, with catalyzed teflon-impregnated porous carbon electrodes to form a single component. The reference discloses that the preparation of catalyst electrodes is achieved by preparing a paste of electrocatalyst, Nafion® H (5% by weight solution dispersed in lower alcohols) and an aqueous solution of fluorinated polyethylene (PTFE). It is further described that the paste is either applied to PTFE-treated porous carbon paper or directly deposited on the PSSA-PVDF membranes.

The ink disclosed in the reference contains NAFION®. As described in the attached Product Information sheet from DuPont™, NAFION® is a copolymer of persulfonic acid and polytetrafluoroethylene. NAFION® does not contain polyvinylidene fluoride (PVDF). The catalyst ink disclosed in the reference contains an electrocatalyst, NAFION® (a copolymer of persulfonic acid and polytetrafluoroethylene - 5% by weight solution dispersed in lower alcohols) and an aqueous solution of fluorinated polyethylene (PTFE). The ink disclosed in the reference does not contain polyvinylidene fluoride (PVDF). Thus, Prakash *et al.* does not disclose every element of the claimed PSSA-PVDF membrane. Therefore, the reference does

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not anticipate the PSSA-PVDF membrane containing a catalyst ink, wherein the ink contains a catalytic material and poly(vinylidene fluoride) as claimed in claim 1.

REJECTION OF CLAIMS 1, 2, 4, 5 and 11-15 FOR OBVIOUSNESS-TYPE DOUBLE PATENTING

1) Rejection of claims 1, 2, 4, 5 and 11-15 over U.S. Patent No. 6,444,343

Claims 1, 2, 4, 5 and 11-15 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,444,343 in view of Cabasso *et al.* The Office Action alleges that the '343 patent teaches a PSSA-PVDF membrane. The Office Action notes that the '343 patent does not explicitly teach a catalyst ink of a catalytic material and PVDF. The Office Action urges that Cabasso *et al* teaches a catalyst ink for a fuel cell containing Pt catalytic material and PVDF. The Office Action concludes that it would be obvious to a skilled artisan to employ a catalyst ink in the '343 patent in order to provide an ionic transfer medium across the membrane. The Office Action further notes that the '343 patent does not explicitly teach a plasticizer. The Office Action urges that Cabasso *et al* teaches a plasticizer, such as DMA. The Office Action concludes that it would be obvious to a skilled artisan to employ a plasticizer for solvation of PVDF. Applicant respectfully traverses the rejection.

Relevant Law

An "obviousness-type" double patenting rejection on the ground the claimed invention is unpatentably obvious over the claims of a U.S. patent having a common inventor is a judicially-created doctrine, rather than a rejection based on the precise terms of 35 U.S.C. §101. *In re Longi et al.* (CAFC 1985) 759 F2d 887, 225 USPQ 645; *ex parte Winquist et al.* (POBA 1972) 177 USPQ 472. It renders not validly patentable a "mere variation" of the prior patented invention which would have been obvious to those of ordinary skill in the relevant art. *Rafac International Ltd. v. Matsushita Electric Corp.* (DC NJ 1990) 17 USPQ2d 1293.

The disclosure of a patent cited in support of a double patenting rejection cannot be used as though it were prior art even where the disclosure is found in the claims. Obvious-type double patenting signifies that the difference between first-patented invention and its variant

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involves only an unpatentable difference, such that grant of the second patent would extend the right of exclusivity conferred by the first patent. Comparison can be made only with what subject matter is claimed in the earlier patent, paying careful attention to the rules of claim interpretation to determine what invention a claim defines and not looking to the claim for anything that happens to be mentioned in it as though it were a prior art reference. A fundamental rule of claim construction requires that what is claimed is what is defined by the claims taken as a whole, every claim limitation (each step) is material. *General Foods Corp. v. Studiengesellschaft Kohle mbH*, 23 USPQ 1839 (Fed. Cir. 1992).

Double-patenting has not been found in instances in which the claims at issue do not embrace the prior patent compounds and/or the claims in the prior patent do not suggest any modification that would have produced the claimed compounds in the patent or application at issue (see, e.g., *Ortho Pharmaceutical Corp. v. Smith*, 22 USPQ2d 1119 (Fed. Cir. 1992)), in which obvious-type double patenting was not found in an instance in which the claims in the patent at suit were directed to compounds that did not encompass, structurally, the compounds claimed in the prior patents, and the compounds claimed in the prior patents did not suggest a modification of those compounds to produce compounds claimed in the patent at suit.

Thus, obvious-type patenting does not exist if the claims at issue do not encompass the claimed subject matter in the copending application, and/or, the claims in the copending application do not suggest a modification to produce the claims in the subject application.

Analysis

Instant claims 1, 2, 4, 5 and 12-14 would not extend the right of exclusivity of the claims of U.S. Patent No. 6,444,343.

Claims of U.S. Patent No. 6,444,343 (the '343 patent)

Claim 1 of the '343 patent, recites:

A fuel cell element which is intended for use in an electrochemical reaction in a fuel cell comprising a polymer electrolyte membrane said membrane being in the form of an interpenetrating network composed of polystyrene sulfonic acid crosslinked within a poly(vinylidene fluoride) matrix, prepared by impregnating a poly(vinylidene fluoride) matrix with styrene monomer and a crosslinking monomer, copolymerizing the styrene monomer and the crosslinking monomer within the poly(vinylidene fluoride) matrix to form a first membrane

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in the form of an interpenetrating network comprising a crosslinked polystyrene polymer within the poly(vinylidene fluoride) matrix, and sulfonating the first membrane to form a final membrane in the form of an interpenetrating network comprising crosslinked sulfonated polystyrene polymer within the poly(vinylidene fluoride) matrix.

Claims 2 and 3 depend from claim 1 and further define the fuel cell element of claim 1.

Independent claim 4 recites:

A methanol fuel cell comprising:

an anode; a cathode; a proton-conducting electrolyte, said electrolyte being a polymer electrolyte membrane in the form of an interpenetrating network composed of polystyrene sulfonic acid crosslinked within a poly(vinylidene fluoride) matrix prepared by impregnating a poly(vinylidene fluoride) matrix with styrene monomer and a crosslinking monomer, copolymerizing the styrene monomer and the crosslinking monomer within the poly(vinylidene fluoride) matrix to form a first membrane in the form of an interpenetrating network comprising a crosslinked polystyrene polymer within the poly(vinylidene fluoride) matrix, and sulfonating the first membrane to form a final membrane in the form of an interpenetrating network comprising crosslinked sulfonated polystyrene polymer within the poly(vinylidene fluoride) matrix; and a pump element, moving said methanol to contact with said anode.

Claims 5 and 6 depend from claim 4 and further define the methanol fuel cell of claim 4.

Independent claim 7 recites:

A method of decreasing methanol crossover rate in a methanol-based fuel cell comprising obtaining a polymer matrix, impregnating said polymer matrix with a mixture comprising styrene and a crosslinking agent, polymerizing said styrene and said crosslinking agent within said polymer matrix to form a membrane in the form of an interpenetrating network comprising a crosslinked polystyrene polymer within said polymer matrix, sulfonating said membrane to form a final membrane in the form of an interpenetrating network comprising crosslinked sulfonated polystyrene polymer within said polymer matrix, and using said final membrane in an electrochemical reaction in said fuel cell.

Claims 8 and 9 depend from claim 7 and further define the method of claim 7.

Independent claim 10 recites:

A method of enhancing efficiency of a fuel cell by using a fuel cell element in an electrochemical reaction in said fuel cell comprising forming a polymer electrolyte membrane by impregnating a poly(vinylidene fluoride) matrix with styrene monomer and a crosslinking monomer, copolymerizing the styrene monomer and the crosslinking monomer within the poly(vinylidene fluoride) matrix to form a first membrane in the form of an interpenetrating network comprising a crosslinked polystyrene polymer within the poly(vinylidene fluoride)

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matrix, and sulfonating the first membrane to form a final membrane in the form of an interpenetrating network comprising crosslinked sulfonated polystyrene polymer within the poly(vinylidene fluoride) matrix, and using said membrane to decrease a permeation of organic fuel which is present in said fuel cell.

Claims 11-14 depend from claim 10 and further define the method of claim 10.

The instant claims

As discussed above, the instant claims are directed to a PSSA-PVDF membrane containing a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride). Applicant respectfully submits that the claims in the '343 patent do not suggest any modification of the claims therein that would have produced the instantly claimed PSSA-PVDF membrane containing a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride). The alleged claims of the '343 patent are directed to the fuel cell element (claim 1), the methanol fuel cell (claim 4), the method of decreasing methanol crossover (claim 7) or the method of enhancing fuel cell efficiency (claim 10). These claims do not suggest any modification that would lead to using a PSSA-PVDF membrane with the catalyst ink disclosed in Cabasso *et al.* Applicant further submits that one of ordinary skill in the art would not be motivated to combine the subject matter of the '343 patent with the catalyst ink of Cabasso *et al.* because the claims do not suggest applying a catalyst ink on to a PSSA-PVDF membrane.

The Office Action alleges that "the '343 patent teaches a PSSA-PVDF membrane" and the Cabasso *et al.* teaches the catalyst ink. It is respectfully submitted that what the '343 patent teaches is not relevant to the issue of obviousness-type double patenting. As noted above:

The disclosure of a patent cited in support of a double patenting rejection cannot be used as though it were prior art. Comparison can be made only with **what invention is claimed** in the earlier patent, paying careful attention to the rules of claim interpretation to determine what invention a claim defines and not looking to the claim for anything that happens to be mentioned in it as though it were a prior art reference. A fundamental rule of claim construction requires that what is claimed is what is defined by the claims taken as a whole, every claim limitation (each step) is material.

It is respectfully submitted that only the scope of subject matter encompassed by the claims in the '343 patent can be used in support of a double patenting rejection.

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Further, applicant respectfully submits that the Office Action is improperly relying on use of hindsight or the claims at issue to combine the claims of the '343 patent with the Cabasso *et al.* reference to produce the claimed subject matter. There is no suggestion in the claims of the '343 patent to use a PSSA-PVDF membrane with a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride).

Further, the Examiner is reminded that obvious-type double patenting signifies that the difference between first-patented invention and its variant involves only an unpatentable difference, such that grant of the second patent would extend the right of exclusivity conferred by the first patent. In the instant case, the difference between the PSSA-PVDF membrane of the instant claims and the fuel cell element of the '343 patent does not constitute an unpatentable difference because the claims of the '343 patent do not teach or suggest a modification to produce a PSSA-PVDF membrane with a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride), as instantly claimed. Therefore, applicant respectfully submits that obvious-type patenting does not exist in the instant case.

Reconsideration and withdrawal of this rejection is requested.

2) Rejection of claim 3 over U.S. Patent No. 6,444,343

Claim 3 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S. Patent No. 6,444,343 in view of Cabasso *et al.*, and further in view of Denton *et al.* The Office Action notes that the '343 patent does not explicitly teach Pt:Ru mixture. The Office Action urges that it would be obvious to a skilled artisan to employ Pt:Ru mixture because Denton *et al* teaches such a mixture.

Analysis

Instant claim 3 would not extend the right of exclusivity of the claims of U.S. Patent No. 6,444,343.

Claims of U.S. Patent No. 6,444,343 (the '343 patent)

As discussed above.

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The Instant claim

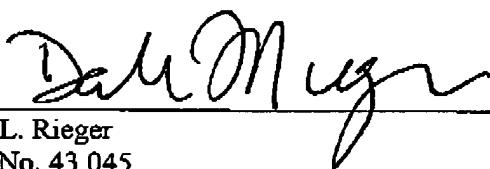
Claim 3 depends from claim 1 and recites that the catalytic material contains Pt and Ru. As discussed above, the claims in the '343 patent do not suggest any modification of the claims therein that would have produced the PSSA-PVDF membrane of claim 1 that contains a catalyst ink, wherein the catalyst ink contains a catalytic material and poly(vinylidene fluoride). Since the claims of the '343 patent do not suggest a catalyst ink used with a PSSA-PVDF membrane, they can not suggest use of a catalytic material that contains Pt and Ru in the catalyst ink.

Once again, the Office Action is improperly relying on use of hindsight or the claims at issue to combine the claims of the '343 patent with the Cabasso *et al* and Denton *et al*. to produce the claimed subject matter. There is no suggestion in the claims of the '343 patent to use a PSSA-PVDF membrane with a catalyst ink and the use of acatalytic material that contains Pt and Ru in the catalyst ink. Therefore, applicant respectfully submits that obvious-type patenting does not exist in the instant case. Reconsideration and withdrawal of this rejection is requested.

Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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Attachment: 2-pg. Reference: Product Information sheet from DuPont™, NAFION®